A telephone interview was conducted with Examiners Louie and Wille on June 7, 2002 to discuss the McNeilly reference. As applicants' attorney pointed out in the interview, McNeilly does not have a liquid layer through which ozone is transported – the ozone is no longer in the chamber once the HF/H_2O layer is formed. Further, McNeilly's liquid solvent, HF/H_2O, is an etching agent that chemically reacts with the surface of the wafer.

As set forth below, although unnecessary to overcome the cited prior art (because no liquid layer forms a transport medium for a reactive gas as recited in the subject claims), all of the independent claims of the application have been amended. The claims now further recite that the film or layer of solvent forming the transport medium is inert to or non-chemically reactive with the surface of a wafer.

Claim 39 recites "a solvent applicator coupled to the chamber and adapted to vaporize and apply a solvent to at least one of the first and second side surfaces of the wafer positioned within the chamber so as to form a film of liquid solvent on said at least one of the first and second wafer side surfaces, *the liquid solvent being inert to said at least one of the first and second wafer side surfaces*."

Claim 42 recites "a liquid depositor adapted to produce a stream of liquid solvent and form a layer of the liquid solvent on at least one major surface of a wafer supported by the wafer carrier within the chamber, wherein the stream is produced in a direction substantially parallel to the at least one major surface of the wafer, *the layer of liquid solvent being inert to said at least one major surface of the wafer*."

Claim 44 recites "a liquid layer former coupled to the chamber and operable to form a layer of liquid on at least one major surface of a wafer supported within the chamber, *the liquid*

being selected so as to be substantially non-chemically-reactive with the reactant gas and the wafer."

Claim 46 recites "a film former adapted to condense a solvent to form a film of liquid solvent onto a surface of the wafer which is to be stripped of photo-resist, *the film of liquid solvent being substantially non-chemically reactive with the photo-resist.*"

Claim 50 recites "a solvent applicator coupled to the chamber and adapted to provide a vaporized solvent to at least one of the first and second side surfaces of the wafer positioned within the chamber so as to condense the vaporized solvent on the at least one of the first and second wafer side surfaces to form a thin layer of solvent thereon, *the solvent being selected to be substantially non-chemically reactive with the wafer.*"

Claim 51 recites "a solvent applicator coupled to the chamber and adapted to vaporize a solvent and condense the solvent on at least one of the first and second side surfaces of the wafer positioned within the chamber so as to form a film of condensed liquid solvent on the at least one of the first and second wafer side surfaces, *the solvent being substantially inert to the wafer.*"

Claim 55 recites "a solvent applicator coupled to the chamber and adapted to drip solvent onto at least one of the first and second wafer side surfaces so as to form a film of liquid solvent on the at least one of the first and second wafer side surfaces, *the solvent being substantially non-chemically reactive with the first or second wafer side surfaces.*"

Claim 56 recites "a film of liquid solvent on the at least one of the first and second wafer side surfaces, *the solvent being substantially non-chemically reactive with a side surface of the wafer.*"

Accordingly, for the reasons discussed in the previously filed response as well as for the foregoing reasons, McNeilly does not teach or suggest the apparatus claimed in the present application and the rejections of the claims should be withdrawn.

CONCLUSION

The present application is in condition for allowance and such action is respectfully requested. If any further issues remain concerning this application, the Examiner is invited to call the undersigned (or call Lisa M. Caldwell at the same telephone number) to discuss such matters.

Respectfully submitted,

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Marked-up Version of Amended Claims
Pursuant to 37 C.F.R. §§ 1.121(b)-(c)

39. (Twice Amended) An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

a chamber sized to receive at least one wafer to be cleaned;

a solvent applicator coupled to the chamber and adapted to vaporize and apply a solvent to at least one of the first and second side surfaces of the wafer positioned within the chamber so as to form a film of liquid solvent on said at least one of the first and second wafer side surfaces, the liquid solvent being inert to said at least one of the first and second wafer side surfaces;

a temperature controller positioned and operable to maintain the at least one wafer at a temperature equal to or lower than about a dew point of the solvent;

a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein

the liquid solvent comprises a transport medium which carries at least some of the at least one reactive gas through the film to said at least one of the first and second wafer side surfaces where the at least one reactive gas chemically reacts with said at least one of the first and second wafer side surfaces.

42. (Three Times Amended) An apparatus for delivering ozone gas to the surface of a wafer comprising:

a wafer receiving chamber;

a wafer carrier positioned within the chamber;

at least one wafer positioned in the wafer carrier in a substantially vertical position within the wafer receiving chamber;

a liquid depositor adapted to produce a stream of liquid solvent and form a layer of the liquid solvent on at least one major surface of a wafer supported by the wafer carrier within the chamber, wherein the stream is produced in a direction substantially parallel to the at least one major surface of the wafer, the layer of liquid solvent being inert to said at least one major surface of the wafer;

an ozone gas source coupled to the chamber so as to deliver ozone gas to the chamber and increase the concentration of ozone gas within the chamber;

the liquid solvent layer transporting ozone gas to the surface of the wafer to thereby expose the wafer surface to ozone.

44. (Twice Amended) An apparatus for cleaning semi-conductor wafers comprising:

a chamber sized to receive at least one wafer to be cleaned;

a reactant gas source inlet and outlet, the inlet and outlet each communicating with the chamber and defining a gas flow path for reactant gas from the inlet to the outlet;

a reactant gas source coupled to the inlet such that reactant gas is delivered from the inlet and flows in the gas flow path to the outlet;

a wafer carrier positioned within the chamber and supporting at least one wafer at least partially in the gas flow path;

a liquid layer former coupled to the chamber and operable to form a layer of liquid on at least one major surface of a wafer supported within the chamber, the liquid being selected so as to be substantially non-chemically-reactive with the reactant gas and the wafer, whereby the reactant gas is transported through the liquid layer to the wafer surface, the reactant gas being selected so as to chemically react with components on the surface of the wafer to clean the wafer; and

a temperature controller configured and operable to cool the at least one wafer in the chamber such that the liquid layer on the at least one major surface of the wafer is formed by condensation.

46. (Twice Amended) An apparatus for stripping photo-resist from semi-conductor wafers comprising:

a film former adapted to condense a solvent to form a film of liquid solvent onto a surface of the wafer which is to be stripped of photo-resist, the film of liquid solvent being substantially non-chemically reactive with the photo-resist;

a gas exposer adapted to expose the film of liquid solvent to a source of at least one reactant gas which is substantially non-chemically reactive with the solvent and which is chemically reactive with the photo-resist so as to the strip the photo-resist from the wafer surface;

a cooling mechanism operable to cool the surface of the wafer; and

whereby reactant gas is transported through the film of liquid solvent to the wafer surface.

50. (Once Amended) An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

a chamber sized to receive at least one wafer to be cleaned;

a solvent applicator coupled to the chamber and adapted to provide a vaporized solvent to at least one of the first and second side surfaces of the wafer positioned within the chamber so as to condense the vaporized solvent on the at least one of the first and second wafer side surfaces to form a thin layer of solvent thereon, the solvent being selected to be substantially non-chemically reactive with the wafer;

a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein

the solvent layer dissolves at least some of the at least one reactive gas in the film such that dissolved gas is brought into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces.

51. (Once Amended) An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

a chamber sized to receive at least one wafer to be cleaned;

a solvent applicator coupled to the chamber and adapted to vaporize a solvent and condense the solvent on at least one of the first and second side surfaces of the wafer positioned

within the chamber so as to form a film of condensed liquid solvent on the at least one of the first and second wafer side surfaces, the solvent being substantially inert to the wafer;

a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein

the condensed liquid solvent comprises a transport medium which dissolves at least some of the at least one reactive gas in the film to the at least one of the first and second wafer side surfaces where the at least one reactive gas chemically reacts with the at least one of the first and second wafer side surfaces.

55. (Once Amended) An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

a chamber sized to receive at least one wafer to be cleaned;

a solvent applicator coupled to the chamber and adapted to drip solvent onto at least one of the first and second wafer side surfaces so as to form a film of liquid solvent on the at least one of the first and second wafer side surfaces, the solvent being substantially non-chemically reactive with the first or second wafer side surfaces;

a temperature control device adapted to cool the at least one wafer;

a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein

the liquid solvent comprises a transport medium which dissolves at least some of the at least one reactive gas in the film where the dissolved gas is brought into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces.

56. (Once Amended) An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

a chamber sized to receive at least one wafer to be cleaned;

a nebulizer adapted to create a mist of a solvent;

a temperature control device operable to cool the wafer such that the mist of solvent condenses on at least one of the first and second wafer side surfaces so as to form a film of liquid solvent on the at least one of the first and second wafer side surfaces, the solvent being substantially non-chemically reactive with a side surface of the wafer;

a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein

the liquid solvent comprises a transport medium that dissolves at least some of the at least one reactive gas in the film where the dissolved gas is brought into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces.